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# TENDER

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**TENDER  
FOR  
OPERATION AND MAINTENANCE  
OF  
AC EQUIPMENTS AND ACCESSORIES**

**TENDER NO.  
IPR/ST/TN-OMC/002/2008  
November 30, 2008**



**प्लाज़्मा संशोधन संस्था  
प्लाज़्मा अनुसंधान संस्थान  
INSTITUTE FOR PLASMA RESEARCH**

निकट इन्दिरा पुल, भाट, गांधीनगर 382 428 (भारत)

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પ્લાઝ્મા સંશોધન સંસ્થા  
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TENDER NOTICE No.IPR/ST/TN-OMC/02/2008 DATED 30/11/2008

Sealed Tenders are invited in Two Parts from reputed manufacturers for providing Comprehensive Operation and Maintenance of AC Equipments and Accessories such as *AC plants upto 375 TR, Chiller Package Units upto 18 TR, Air cooled Package units upto 40 TR, Air washer Unit of 12000 CFM, Ventilation Systems of different capacities, RF Cooling systems of 68 TR, D.M. Water Plants upto 30 CM, and Soft Water Plant for cooling towers upto 30 CM, etc.* at IPR for a period of two years. Those Vendors who (a) are manufacturers of the equipments like Open type Reciprocating/Screw Compressors (b) have servicing facility in Ahmedabad / Gandhinagar and (c) have executed similar kind of Operation and Maintenance work in a single contract of not less than Rs.10 Lacs in a year consecutively for two years can collect the tender documents from the Stores Incharge upto 10/12/2008 with a written request supporting proof for the above mentioned qualifying criteria mentioned at (a) to (c) above and a tender fee of Rs.200.00 by DD/PO/Banker's Cheque payable at Ahmedabad in favour of Institute for Plasma Research. Sealed envelope containing both Part-A and Part-B in separate sealed envelope superscribing the envelope with the above tender no., date, due date and brief description of tendered item should be submitted to the *Stores Incharge* at the above address by 1.00 p.m. on 26/12/2008. Part -A shall be opened on the same day at 2.30 p.m. in the presence of attending tenderers.

The Director, IPR reserves the right to accept or reject the tenders in full or part thereof without assigning any reasons. For details please visit our website [www.ipr.res.in//purchasetenders.html](http://www.ipr.res.in//purchasetenders.html).



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## **Part - A [i]**

### **TECHNICAL BID**

Consisting of  
Scope, Equipment Details,  
Plant Maintenance Schedule etc.

(Page No. 5 to 50)





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## SCOPE OF ANNUAL OPERATION AND MAINTENANCE OF PLANTS

(Refer PLANTS MAINTENANCE SCHEDULE for annual maintenance works involved in the AC system & AHUs to keep the equipments in proper and safe operating condition)

### A. PLANTS OPERATION:

#### 1. SPECIFIC DUTIES OF OPERATORS:

- a) Routine operation of the system as per our requirement
- b) Seasonal starting and stopping of the system as per our requirement.
- c) Taking all required readings regularly, maintaining the logbook record up to date with observations, if any.
- d) Operations like pump down, removing and charging refrigerant, purging, leak testing, evacuation and dehydration etc.
- e) Cooling water and chilled water system leakage detection in the plant.
- f) All other routine inspections to ensure smooth running of the plant as well as those which are otherwise related to satisfactory plant operations, viz., safety related checks.
- g) Performing all the operations according to standard methods, without damaging other working parts of the system.
- h) Maintaining and submitting monthly presence record to Section Head / Division Head / Project Leader, AC&WC section along with the routine bill.
- i) Maintaining operation logbook for the inspection of Section Head / Division Head, AC&WC section
- j) Taking adequate insurance cover against all risks for the persons deployed by the contractor.



## 2. OPERATION TIME:

The period of operation in terms of days and time during the tenure of contract shall be as follows:

- a) Normal Time of operation : 8.30 a.m. to 5.30 p.m.
- b) Normal Operation in a week : Monday to Saturday.
- c) Normal No-Operation Days : Sundays, Three National Holidays, i.e. 26<sup>th</sup> January, 15<sup>th</sup> August and 2<sup>nd</sup> October and any other days to be declared by the Institute.
- d) Extra hours : Before and after the normal time of operation, i.e. before 8.30 a.m. and after 5.30 p.m. including Sundays if warranted.

*(Prior intimation will be given to the contractor for carrying out operation outside the office hours mentioned above. The extra hours of operation work shall be got certified by Section Head/Division Head of WC&AC section)*

## 3. MANPOWER ARRANGEMENT:

The tenderer if awarded the contract shall deploy the following manpower for operation and maintenance of plants:

- a) **For operation of plants:**
  - (i) 1 No. of Diploma holder / ITI / NCVT / Equivalent in Refrigeration & Air conditioning with at least 5 yrs. relevant experience in the similar work as **Operation Supervisor** during regular shift / office hours.
  - (ii) 4 Nos. of ITI / NCVT / Equivalent in Refrigeration & Air conditioning qualified skilled operators with at least 3 yrs. relevant experience in the similar work.
  - (iii) 4 Nos. semi-skilled operators during regular shift / office hours.
  - (iv) 1 No. of Diploma holder / ITI / NCVT in Electrical field with at least 3 yrs. relevant experience in the similar capacity plants during regular shift / office hours.
- b) **For maintenance of plants:** The operators for operation of the plants can be utilized for maintenance related activities if plants are not in the operations. But if winter shutdown maintenance / maintenance schedule / situation demands additional manpower, then successful tenderer shall deploy following additional manpower for maintenance of plants:
  - (i) 1 No. of Service mechanic qualified ITI / NCVT / Equivalent (Refrigeration & Air conditioning) with at least 5 yrs. relevant experience in the similar work
  - (ii) 2 nos. semi skilled mechanic/ helpers with enough experience in similar work.
  - (iii) 1 No. of Diploma holder / ITI / NCVT I in Electrical field with at least 5 yrs. relevant experience in the similar capacity plants
- c) **Supervision:**
  - (i) **On Regular Basis throughout the period of Contract**



The tenderer if awarded the contract, shall identify a Senior Engineer / Senior Supervisor (having work experience in the similar field) who would regularly visit IPR **twice in a week** to inspect and supervise the work to be carried out under the contract. He shall liaise with the Section Head/Division Head, AC&WC section to seek clarifications and instructions related to the work contracted to the tenderer.

**(ii) As and when required:**

The tenderer, if awarded the contract, shall have to deploy, if warranted, a team of experienced mechanic/s and helper/s within a reasonable time to attend to the problems and arrange to solve the same by carrying out necessary repairs and replacement if any, to our satisfaction as per the contract.

Besides, the persons identified by the contractor for the work at IPR shall be made available during this period and as and when required by Section Head/Division Head, AC&WC section.

**d) The Contractor shall be Responsible for:**

- (i) Deployment of operators in the main plant rooms on continuous basis.
- (ii) Withdrawing the operator/s / mechanic/s who is / are not found suitable according to the opinion of the Section Head/Division Head, AC & WC section and replacing him / them with suitable persons.
- (iii) Deployment of suitable persons as per the contract for taking over and carrying out operation and maintenance of the plants and equipments in consultation of Section Head/Division Head, AC & WC section. Deployment of persons who are not qualified and experienced for carrying out the work shall not be permitted. (Proof of qualification of manpower to be submitted at the time of taking over the plants.)
- (iv) Complying with the requirements of IPR security for regulating entry of the persons deployed for the contract. Further, in and out time of the persons deployed by the contractor for various activities under this contract shall be recorded in the prescribed register at the Main Gate. The Contractor shall be required to keep a similar register with the supervisor / Section Head / Division Head of AC & WC section.

**B. CONDITIONS FOR PLANTS MAINTENANCE:**

**The annual maintenance (mechanical and electrical) all in all service contract covers:**

1. Preventive maintenance – Preventive Maintenance shall be carried out preferably in the weekends or as instructed by the Section Head / Division Head, AC & WC Section.
2. Break down service – The break down service consists of attending to the complaint within a reasonable time, identification of fault, Working out Repairs and replacement Procedure in consultation with the Section Head/Division Head AC & WC Section, completing the repairs and replacement to the satisfaction and commissioning of the equipments within the targeted time. Please go through the details given under Maintenance / Servicing Schedule.
3. All the preventive maintenance and break down service must be carried out as per the instruction and time schedule provided by designated Engineer / Section Head / Division Head, AC&WC section. The time schedule shall be prepared and decided in coordination with the designated Engineer / Section Head / Division Head, AC&WC section and it shall be strictly adhered to.
4. The temperature and humidity conditions in the air-conditioned areas will have to be recorded daily.



5. The Contractor shall maintain daily reports as per the format as required by the designated Engineer / Section Head / Division Head, AC&WC section. The said daily reports maintained by you shall be got countersigned by designated Engineer whose instructions would be strictly followed. Monthly report covering the Preventive Maintenance and Break Down Service shall be prepared and submitted to Section Head / Division Head, AC&WC section. A brief monthly report form may be got approved by the Section Head / Division Head, AC & WC for compliance.
6. The Contractor shall be responsible to carry out all repairs of the equipments involving repair or replacement of components. The details of repair and replacements are given in Maintenance / Service Schedule.
7. The Contractor shall keep enough spares and consumables in stock to meet the requirements during the period of contract. The contractor shall also keep 1 No. 61 Kgs R-22 Gas Cylinder, 50 Kg compressor oil, gasket sets, 'O' Ring set etc. at site. Contractor must keep a copy of received Challans with entry of Gate and Stores
8. The Contractor shall use only genuine original parts. If it is found otherwise it will be termed as a breach of contract. In case if the original manufacturer do not exist or particular item is phased out, then the other available makes or model of the parts shall be got approved from the concerned engineer or Section Head / Division Head and installed at no extra cost.
9. Notwithstanding as to what is specifically stated, it shall be the responsibility of the successful tenderer to attend to all the preventive maintenance/routine maintenance and repairs and breakdown services including replacements of all parts/components.
10. The repairs must be carried out without damaging other working parts of the system.
11. IPR will not supply any tool / tackle / equipment except power supply and water for any work. After satisfactory completion of each of the work, the Contractor shall get approval from designated Engineer/ (or) Section Head/Division Head / (or) Project Leader-AC&WC section. In case any spares parts, equipment or accessories which supplied by IPR during the maintenance/ repairing/ service purpose on temporary basis, the AMC contractor will be responsible for it and has to be returned back same to IPR in all good manners.
12. Logbook shall be maintained for each plant and the list of work carried out like servicing, maintenance, repairs etc. shall be recorded systematically on a regular basis. The recordings in the logbook shall be got endorsed by the designated Engineer from time to time and verified by the Section Head/Division Head, AC&WC section. The Logbook shall be the basic record for all purposes.
13. **Normally repairing and replacement works should be done at IPR Campus. However, if it is to be taken outside IPR campus to and fro transportation charges including any other charges like transit insurance etc. shall be borne by the contractor.**

**C. PENALTY:**

**1. Failure to provide Manpower as per Clause A.3 above**

- a) Penalty for absence of Operation Supervisor: Rs.500/- per day shall be recovered from the routine bill of the contractor
- b) Penalty for absence of qualified skilled Operator/ Electrician/ Mechanic: Rs.400/- per day shall be recovered from the routine bill of the contractor.



- c) Penalty for absence of semiskilled person: Rs. 200/- per day shall be recovered from the routine bill of the contractor.
- d) Penalty for absence of Senior Supervisor / Senior Engineer: Rs. 500/- per visit shall be recovered from the routine bill of the contractor.

The above penalty shall be in addition to the consequential loss the Institute may incur for substituting the persons with same number or more for running the system in view of the failure of contractor to provide manpower.

**2. Failure to complete the repair and replacement work by the contractor as per the contract.**

A maximum period of 7 days is allowed to the contractor to carry out the minor repairs and replacement. If the Contractor fails to complete the minor repairs and replacement within 7 days, IPR will charge penalty @ Rs. 300/- per day from the 8<sup>th</sup> day till completing minor repairs/replacement.

If the major repairs/replacement listed below cannot be completed within 7 days due to unforeseen reasons/causes, extension of time limit may be granted by the Designated Engineer / Section Head / Division Head, AC & WC Section in writing after reviewing the nature of problem. The decision of designated Engineer / Section Head/Division Head, -AC&WC section in this regard shall be final and binding.

**Major repairs and replacement: (Please refer 1a, 1b, 9a and 12 Plant Maintenance Schedule)**

- Screw shaft and rotor repairs / replacement in Screw compressor
- Crankshaft repairs/ replacement of reciprocating compressor
- Rewinding of motor of compressors, AHUs and pumps.

**3. CONTRACTOR'S MATERIAL:**

- a. IPR shall not be responsible for the safety of material brought by the contractor to IPR in connection with the contract. The successful tenderer shall be fully responsible for the safe custody of his material.
- b. The contractor shall obtain Gate Pass from IPR for taking out his material from IPR campus. Contractor shall not be allowed to take out any material including his material without a valid Gate Pass to be issued by Section Head / Division Head, AC & WC or Stores Incharge. Normally the Contractor shall not be allowed to take out any material on holidays and before 10.00 Hrs. and after 5.00 p.m. on working days.
- c. All the materials brought to IPR in connection with the work contracted to the Contractor are to be routed through IPR Stores with supporting delivery Challans in triplicate indicating full description, quantity, value etc. This procedure should be followed strictly during the contract period.





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### SPECIFICATIONS OF PLANT EQUIPMENTS

S.NO	DESCRIPTION OF PLANTS / SYSTEMS	CAPACITY	NORMAL HOURS OF OPERATION
1.	KBAC plant	240 TR	8-12 hrs
2.	TBAC plant	200 TR	8-12 hrs
3.	SST1 Air conditioning Plant	375 TR	8-12 hrs
4.	Chiller Package Unit (for Beta Lab Experimental Device)	7 TR	8-12 hrs
5.	Chiller Package Unit (for Spectroscopy/ Diagnostic Experimental Device)	10 TR	8-12 hrs
6.	Chiller Package units (for First wall experiment, LVPD experiment Device & ECRH system experiments)	27 TR	8-12 hrs
7.	Chiller Package unit (for First wall vacuum furnace experiments)	10 TR	8-12 hrs
8.	Chiller Package Unit (for Laser Experimental Systems)	15 TR	8-12 hrs
9.	Air cooled Package unit (for Control room of Aditya Hall)	10 TR	8-12 hrs
10.	Air cooled Package unit (for APPS Hall)	20 TR	8-12 hrs
11.	Air Cooled Package unit (for Computer Hall (Mezzanine Floor))	10 TR	24 hrs
12.	Air Cooled Package unit (for Computer Hall)	40 TR	24 hrs
13.	Air Cooled Package unit (for R.F. Lab.- Ground. & First Floor)	40 TR	8-12 hrs
14.	Air Cooled Package units (for Administration & Purchase section)	15 TR	8-12 hrs
15.	Air washer Unit (for canteen)	12000 CFM	8-12 hrs
16.	Ventilation Systems (for various plant rooms / Utility Halls /	Diff. capacities	8-12 hrs



	Cryogenic Hall/ He-Compressor Hall)		
17.	D.M. Water Plants (for various Water Cooling plants)	10 & 30 CM	8-12 hrs
18.	Soft Water Plant (for Water Cooling Plants)	30 CM	8-12 hrs
19.	R.F. Water Cooling systems (for various RF experimental systems)	68 TR	8-12 hrs

**Note:**

1) S. No. 1 KBAC Plant may be renovated / upgraded during the contract period, so operation and all in all maintenance of KBAC Plant may be removed from the scope of tenderer during renovation. After renovation, only Operation of the KBAC plant may be under the scope of tenderer.



<b>1</b>	<b>KBAC Plant</b>					
	<b>Location: Kitchen Basement Plant room</b>					
1 A	Chiller Package Units consists of following equipments:	3 nos.	40 TR	Blue Star		For comfort Air-conditioning
	i) Compressor	3 nos.	40 TR	Kirloskar	AC 570	R-22 based reciprocating type compressors with drive package
	ii) Condenser	3 nos.	40TR	Blue Star	CDS-30183L	Shell and Tube type
	iii) Chiller (Evaporator)	3 nos.	40TR	Blue Star	DXC-41305	Shell and Tube type
	iv) Motor for compressor.	3 nos.	50 hp	Sidemen's	200L	SPDP/3P/1500 rpm/star delta starter with drive packages
	v) Refrigerant piping	3 sets				This includes shut off valves, drier, filters, site glass and copper piping with gauge panel boards
1B	Chiller Package Units consists of following equipments:	3 nos.	40 TR	Voltas		
	i) Compressor	3 nos.	40 TR	Voltas	5060	Reciprocating type compressors with drive package
	ii) Condenser	3 nos.	40TR	Voltas	09043	Shell and Tube type
	iii) Chiller (Evaporator)	3 nos.	40TR	Voltas	1004	Shell and Tube type
	iv) Motor for compressor.	3 nos.	50 hp	NGEF		SPDP/3P/1500 rpm/star delta starter, with drive packages
	v) Refrigerant piping	3 sets				This includes shut off valves, drier, filters, site glass and copper piping with gauge panel boards
1 C	Controls	6 sets				
	i) Expansion valves	12 nos	20 TR	Sporlan	HVE-20	
	ii) RSV	6 nos.		Sporlan	P-180	
	iii) HP/LP Cut outs	6 nos.		Indfoss	MP-15	
	iv) OSS	6 nos.		Indfoss	MP-55	
	v) Operating Thermostat	9 nos.		Honeywell	T678A	2 nos. with each Blue star plant and 1 no. with each Voltas plant



	vi) AFT	6 nos.		3-Honey+ 3 White roger		
	vii) Refrigerant pres.gauges	21 nos				HP-6 nos, LP-6 nos, OP-6 nos, COP-3 nos.
	viii) Condenser & Chiller diff. Press. Switches	12 nos		Indfoss	IPSD-50	
	ix) Water press. Gauges	52 nos		H. Guru / Fiebig		4" dial type
	x) Water temp. Gauges	38 nos		H. Guru / Fiebig		Stem type / Dial type
	xi) USV	12 nos				9 nos. in Blue star and 3 nos. in Voltas plants
	xii) CCH	6 nos	80 Watts			1 no. in each compressor
1 D	Condenser & Chiller Pumps	14	7.5 HP	8-KBL 6-Beacon	KDS+844 2DM6 & 2DM7	All are Monoblock pumps, DOL starter type
<b>Air Handling Units</b>						
1 E	i) Library area	1	17000cfm	Thermflow	THA-11 With Sidemen's TEFC/12.5 Hp/4P motor	With drive package, metallic prefilters, 3 way diverting valve, and thermostat. Insulated Ducting, canvass, and grilles. Fresh air filters, dampers, electrical solenoid operated fire dampers.
	ii) Seminar Hall	1	10000 cfm	Thermflow	THA-11 with Sidemen's TEFC/7.5 Hp/4P motor	As mentioned above
	iii) Beta Lab.	1	15000 cfm	Thermflow	THA-9 with Sidemen's TEFC/12.5 Hp/4P motor	As mentioned above
	iv) Aditya Hall-A	1	18000 cfm	Weathermake	WH-11 with KEC TEFC/12.5 Hp/4Pmotor	As mentioned above
	v) Aditya Hall-B	1	15000 cfm	Weathermake	WH-7 with KEC TEFC/12.5 Hp/4P motor	As mentioned above
	vi) Aditya Control room	1	5000 cfm	Weathermake	WH-3 with KEC TEFC/5 Hp/4P motor	As mentioned above
1 F	Fan Coil units	62	1.5 TR	Rohini	Vertical	Vertical type with angular discharge, 1/16 hp/ 3 speed motor, selector switch, prefilters, isolation valves at Inlet/Outlet of chilled water line.
1 G	Cooling	2	125 TR	Paharpur	1868P	FRP, induced draft



	Towers					type, 114 CM/Hr with 10 hp/TEFC/750 rpm ABC fan motor.
1 H	Drain water pumps	1	3 HP			Drain water pumps used to drain the water from the condensate collection pits at KBAC plant room.
1 I	Insulated Chilled water and cooling water MS piping	Lot				This covers entire Interconnected water piping between above listed all equipments like chillers, condensers, AHUs', FCUs', pumps, CTs', heat exchangers etc. Also, this will cover all necessary fittings and controls mounted in the piping like Gate & Globe valves, NRVs', Pot strainers, Y-strainers, pressure and temp. Gauges purge valves, flow switches, modulating valves, float valves, expansion tank and its connected valves. etc. fitted in the piping of the plants
1 J	Main Electrical panel	1				Electrical panel with incomer 300 amps ACB. This Panel accommodates feeders of 3 Nos. AC570 Compressors Motors, 8 Nos. Water Pumps, and 2 Nos. Cooling Tower Fan Motors, annunciation cum indication panel, with all electrical, mechanical & electronic, parts/controls and other accessories installed, with all internal/external wiring (control, power and earthing) for all of above equipments/items concerned.
1 K	Main Electrical panel	1				Electrical panel with incomer 300 amps MCCB. This panel



						accommodates feeders of 3 Nos. 5H60 Compressor motors, 6 Nos. Water pumps, annunciation-cum-indication panel with all electrical, mechanical & electronic, parts/controls and other accessories installed, with all internal/external wiring (control, power and earthing) for all of above equipments/items concerned.
1L	Local Electrical Panels for AHUs'	6				Electrical operating panel boards for all AHUs' with all spares/measuring devices of reputed make like L&T / Sidemen's /EE etc.
<b>2</b>	<b>TBAC Plant</b> <b>Location: Tokamak Basement Plant room</b>					
2 A	Chiller Package Units and ancillaries	2	100 TR	Blue Star		For comfort Air-conditioning and cooling of Aditya and LVPD experimental devices.
	i) Compressor	2	100 TR	Kirloskar	AC 1270	R-22 based reciprocating type compressors with drive package.
	ii) Condenser	2	100TR	Blue Star	CDS-41305	Shell and Tube type
	iii) Chiller (Evaporator)	2	100TR	Blue Star	YCH101	Shell and Tube type
	iv) Motor for comp.	2	120 hp	Sidemen's	200L	SPDP/3P/1500 rpm/star delta starter with drive packages.
	v) Refrigerant piping	2 set				This includes shut off valves, drier, filters, site glass and copper piping with gauge panel boards.
2 B	Controls 2 sets					
	i) Expansion valves	4	52 TR	Sporlan		
	ii) RSV	2		Sporlan	P-180	
	iii) HP/LP Cut outs	2		Indfoss	MP-15	
	iv) OSS	2		Indfoss	MP-55	



	v) Operating Thermostat	6		Honeywell	T678A	2 nos. with USV and 1 no with RSV in each plant
	vi) AFT	2		Honeywell		
	vii) Refrigerant pres. gauges	6				HP-2 nos, LP-2 nos, OP-2 nos,
	viii) Condenser & Chiller diff. Press. Switches	4		Indfoss	IPSD-50	
	ix) Water press. Gauges	35		H. Guru / Fiebig		4" dial type
	x) Water temp. Gauges	24		H. Guru Fiebig		Stem type / Dial type
	xi) USV	6				3 nos. in each plant for loading and unloading of compressor.
	xii) Conductivity, pH meter	2 nos.				
	xii) CCH	2	200 Watts			1 no. in each compressor
2 C	Chiller Pumps	3	15 HP	Beacon	3DM8	Monoblock pumps/ 3 Q/2900 rpm
2 D	Cooling water pumps	3	25 HP	KBL	3UPIM15	Split casing type with TEFC motor, drive package.
2 E	Air Handling Unit at room no.37, FFL of main bldg.	1	6400cfm	Batliboi	AHU-6 With TEFC/7.5 Hp/4P motor	With drive package, metallic prefilters, 3 way diverting valve, and thermostat. Insulated Ducting, canvass, and grilles. Fresh air filters, dampers, electrical solenoid operated fire dampers.
2 F	Fan Coil units	53	2 TR	Batliboi	Horizontal	Side throw, 1/12 hp/ 3-speed motor, selector switch, prefilters, isolation valves at Inlet/Outlet of chilled water line.
2G	Cooling Towers	4	125 TR	Paharpur	1868P	FRP, induced draft type, 114 CM/Hr with 10 hp/TEFC/750 rpm ABC fan motor.
2 H	Insulated Chilled water and cooling water MS & SS piping	Lot				This covers entire Interconnected water piping between above listed all equipments like chillers, condensers, AHUs', FCUs', pumps,



						experimental devices, CTs', heat exchangers etc.. this will cover all necessary fittings and controls mounted in the piping like Gate & Globe valves, BFVs', NRVs', Pot strainers, Y-strainers, pressure and temp. Gauges, purge valves, flow switches, modulating valves, float valves, expansion tank and its connected valves etc. fitted in the piping of the plants. <b>Note:</b> this includes SS piping, fittings, valves, and flow meters with display units, temperature and Press. Gauges fitted in the DM water circulation system meant for LVPD, Aditya and Cryogenic cooling systems.
2 I	D.M. Water Pumps for Aditya Experimental devices	2	10 HP	KBL	KPD 32/13	Monoblock type/2900 rpm. The pump will circulate D.M. water to the experimental device for cooling purpose through 13 KW PHE. This pump is secondary side cooling pump.
2 J	D.M. Water Pumps for LVPD experimental devices	2	15 HP	Flowchem		Pump with 15-hp/TEFC/4P motor, coupled type, The pump will circulate D.M. water to the experimental device for cooling purpose through 240 KW PHE. This pump is secondary side cooling pump.
2 K	Main Electrical panel	1			Floor mounted type	Electrical panel with incomer 400 amps MCCB. This panel accommodates feeders of 2 nos. Compressors Motors, 6 Nos. Water Pumps, 4 Nos. Cooling Tower Fan



						Motors, and 4 nos. D.M. Water pumps, 2 nos. raw water pumps, annunciation cum indication panel, with all electrical, mechanical & electronic, parts/controls and other accessories installed, with all internal/external wiring (control, power and earthing) for all of above equipments/items concerned.
2 L	Local Control panel for AHU	1			Wall mounted type	Starter panel for AHU motor with all electrical, mechanical & electronic, parts/controls and other accessories installed in side the panel, with all internal/external wiring (control, power and earthing).
<b>3</b>	<b>SST1 Air conditioning Plant, Location : Tokamak Basement Plant room</b>					
3 A	Screw type, skid mounted water Chiller Package units with in house safety controls, sensors, gauges and Auto loading /unloading devices consists of following equipments:	3	125 TR	Dunham Bush	WCFX15E1D1C	For comfort Air-conditioning of SST1 Building. Which includes Tokamak Hall, R.F. & NBI bay, control room and Diagnostic halls.  Note: This plant can be also run as an alternate for the cooling of cryogenic experimental devices in addition to the Air-conditioning.
	i) Compressor	3	125 TR	Dunham Bush		R-22 based screw type hermetically sealed compressors with instruments and controls like pressure transducers, temperature controller and sensors, motorized valve for loading unloading, photo sensor, crankcase heater, refrigerant level



						sensor etc.
	ii) Condenser	3	125 TR	Dunham Bush		Shell and Tube type
	iii) Chiller (Evaporator)	3	125 TR	Dunham Bush		Flooded type
	iv) Motor for comp.	3	83 KW	Dunham Bush		This is sealed type refrigerant cooled motor mounted on compressor shaft with gear mechanism. Double Delta starter.
	v) Micro processor Panel	3		Dunham Bush		This panel gives the status of chilling machine with LCD display and houses the soft starter and other Power / control contactors and electronic controls/circuits. This panel is mounted on each chilling machine.
3 B	Chiller Pumps	3	25 HP	Beacon	BWP 100/400	Back pull out pumps with KEC make 25 HP/ 3 Ph/1500 rpm motor, drive package.
3 C	Cooling water pumps	3	15 HP	Beacon	BWP 80/260	Back pull out pumps with KEC make 15 HP/ 3 Ph/1500 rpm motor, drive package
3 D	D.M. Water Pumps for Cryogenic experimental devices	2	25 HP	KBL		Pump with 25 hp/TEFC/4P motor, coupled type, The pump will circulate D.M. water to the experimental device for cooling purpose through 1250 KW PHE. This pump is secondary side cooling pump.  Note: This system works as a standby unit to the main cooling system for Cryogenic. This will work in conjunction with Screw chilling plant at partial load.
3 E	<b>Air Handling Units</b>					
	i) MEL area	1	19860cfm	Ethos	Double skin type	With drive package, metallic prefilters, 3 way diverting valve, and thermostat.



						Insulated Ducting, canvass, and grilles. Fresh air filters, dampers, electrical limit switch operated fire dampers and fire alarming panel with ionization type smoke detector with KEC make TEFC/ 15 Hp / 4P motor.
	ii) Diagnostic Lab.	1	10000 cfm	Ethos	Double skin type	As per mentioned above but with 10 HP motor
	iii) Central Control Room	1	15350 cfm	Ethos	Double skin type	As per mentioned above but with 10 HP motor. This unit also has 16 nos. Dyna make bag type micro filters of 1 micron.
	iv) N.B.I. First floor	1	14000 cfm	Ethos	Double skin type	As per mentioned above but with 10 HP motor
	v) Tokamak Basement	1	8950 cfm	Ethos	Double skin type	As per mentioned above but with 10 HP motor
	vi) R.F. First floor	1	17000 cfm	Ethos	Double skin type	As per mentioned above but with 15 HP motor
	vii) Tokamak Hall	1	19000 cfm	Ethos	Double skin type	As per mentioned above but with 15 HP motor
3 F	Cooling Towers	2	150 TR	Paharpur	3870	FRP, induced draft type with 7.5 HP/3 Ph/900 rpm motor of ABB make and belt drive package, float valve, drain, quick fill arrangements.
3 G	Insulated Chilled water and cooling water MS piping	Lot				This covers entire interconnected water piping between above listed all equipments like chillers, condensers, AHUs', pumps, CTs', heat exchangers etc.. Also, this will cover all necessary fittings and controls mounted in the piping like Gate & Globe valves, NRVs', BFVs', Balancing valves, Pot strainers, Y-strainers, pressure



						and temp. Gauges purge valves, flow switches, modulating valves, float valves, expansion tank and its connected valves. etc. fitted in the piping of the plants.
<b>3 H</b>	<b>Electrical Panels for above utilities:</b>					
	i) Main Electrical Panel	1			Floor mounted type	Main Electrical panel comprising of 800 amp MCCB in main incoming feeder and 3 x 400 amp MCCB for screw chiller packages main supply along with 6 feeders for chilled / condenser water circulation pumps and 2 feeders for cooling tower fan motors., 2 for cryogenic D.M. Water pumps. with all electrical, mechanical & electronic, parts/controls and other accessories installed in side the panel, with all internal/external wiring (control, power and earthling).
	ii) Status indication panel	1			Floor mounted type	This indicates the status of screw chiller packages, pumps, AHUs' with remote ON/OFF facilities with all electrical, mechanical & electronic, parts/controls and other accessories installed in side the panel, with all internal/external wiring (control, power and earthling).



	iii) Local Control panel for AHUs'	7			Wall mounted type	Starter panel for AHU motor with all electrical, mechanical & electronic, parts/controls and other accessories installed in side the panel, with all internal/external wiring (control, power and earthing)
<b>4</b>	<b>Chiller Package Unit for Beta Lab Experimental Device</b> <b>Location: Near Beta Lab.</b>					
4 A	Chiller Package Unit consists of following equipments:	1	7 TR	Voltas		For cooling of Beta Lab. Experimental device
	i) Compressor	2	7 TR	Voltas	06D024	R-22 based semi-sealed, reciprocating type compressors. 1 compressor acts as a stand by unit. With refrigerant cooled sealed motor 11.25 KW.
	ii) Condenser	1	7TR	Voltas	9 ABB	Air cooled tube and fins type
	iii) Chiller (Evaporator)	1	7TR	PAT	DX	Shell and Tube type
	iv) Refrigerant piping	1set				This includes shut off valves, drier, filters, site glass and copper piping with gauge panel boards.
<b>4 B</b>	<b>Controls</b>					
	i) Expansion valves	1	7 TR	Sporlan	TEV05	
	ii) HP/LP Cut outs	1		Indfoss	MP-15	
	iii) OSS	1		Indfoss	MP-55	
	iv) Operating Thermostat	1		Honeywell	T678A	
	vi) AFT	1		Honeywell		
	vii) Refrigerant pres. gauges	4		H. Guru/ Fiebig		HP-2 nos, LP-2 nos,
	viii) Chiller diff. Press. Switches	1		Indfoss	IPSD-50	
	ix) Water press. Gauges	2		H. Guru/ Fiebig		4" dial type
	x) Water temp. Gauges	1		Fiebig		Stem type
	xi) USV	2				1 no. In each compressor



	xii) CCH	2	40 Watts			1 no. In each compressor
4 C	Chilled Water Pumps	4	2 HP	Beacon	1-1/2 DM6-LD	All are Monoblock pumps. 2 are for primary chilled water circuit and 2 nos. are for secondary Water-cooling circuits.
4 D	Chilled Water Storage Tank	1	1000 liters	Sintex	Cylindrical type	Insulated chilled water tank for the storage purpose
4 E	Chilled water insulated piping	1	Lot			This covers entire interconnected water piping between above listed all equipments like chillers,, pumps, , experimental devices etc.. Also, this will cover all necessary fittings and controls mounted in the piping like NRVs', BFVs', Y-strainers, pressure and temp. Gauges purge valves, flow switches, fitted in the piping of the plants.
4 F	Local Control panel for Plant	1	No		Floor mounted type	Starter panel for above plant with all electrical, mechanical & electronic, parts/controls and other accessories installed in side the panel, with all internal/external wiring (control, power and earthling)
<b>5</b>	<b>Chiller Package Unit for Spectroscopy/ Diagnostic Experimental Device</b> <b>Location: Near APPS Battery room</b>					
5 A	Chiller Package Unit consists of following equipments:	1	10 TR	Kirloskar		For cooling of Beta Lab. Experimental device
	i) Compressor	1	10 TR	Kirloskar	FK4	R-22 based reciprocating type compressor with 15 HP/4P/CG make motor and drive package.
	ii) Condenser	1	10 TR		9 ABB	Air cooled tube and fins type
	iii) Chiller (Evaporator)	1	10 TR		DX	Shell and Tube type



	iv) Refrigerant piping	1set				This includes shut off valves, drier, filters, site glass and copper piping with gauge panel boards.
5 B	Controls					
	i) Expansion valves	1	10 TR	Sporlan	HVE10	
	ii) HP/LP Cut outs	1		Indfoss	MP-15	
	iii) OSS	1		Indfoss	MP-55	
	iv) Operating Thermostat	1		Honeywell	T678A	
	vi) AFT	1		Honeywell		
	vii) Refrigerant pres. gauges	4		H. Guru / Fiebig		HP-2 nos, LP-2 nos,
	viii) Chiller diff. Press. Switches	1		Indfoss	IPSD-50	
	ix) Water press. Gauges	2		H. Guru / Fiebig		4" dial type
	x) Water temp. Gauges	1		Fiebig		Stem type
	xi) USV	2				1 no. in each compressor
	xii) CCH	2	40 Watts			1 no. In each compressor
5 C	Chilled Water Pumps	2	2 HP	Beacon	1-1/2 DM6-LD	All are Mono block pumps. Water-cooling circuits.
5 D	Chilled Water Storage Tank	1	1000 liters	Sintex	Cylindrical type	Insulated and chilled water tank for the storage purpose
5 E	Chilled water insulated piping	1	Lot			This covers entire interconnected water piping between above listed all equipments like chillers,, pumps, , experimental devices etc.. Also, this will cover all necessary fittings and controls mounted in the piping like NRVs', BFVs', Y-strainers, pressure and temp. Gauges purge valves, flow switches, fitted in the piping of the plants.
5F	Local Control panel for Plant	1	No		Floor mounted type	Starter panel for above plant with all electrical, mechanical & electronic, parts/controls and other accessories



						installed in side the panel, with all internal/external wiring (control, power and earthing)
<b>6</b>	<b>Chiller Package units for First face wall experiment, LVPD and ECRH experiment Device Location: Out side of MEL Lab. &amp; Nr. Utility building.</b>					
6 A	Chiller Package Unit (Industrial Water Cooler type) consists of following equipments:	3	9TR	Razvi		For cooling of LVPD & First face wall Experimental devices Note: Each package unit is having twin's individual circuit of 4.5 TR .
	i) Compressor	6	5 TR	Kirloskar-	AG series	R-22 based sealed reciprocating type compressor.
	ii) Condenser	3	9 TR		2 HP	Air cooled tube and fins type
	iii) Chiller (Evaporator)	3	9 TR		DX	This evaporator is embedded in the tank like in water coolers and the tank is having capacity of 750 liters water storage.
	iv) Refrigerant piping	6 set				This includes shut off valves, drier, filters, site glass and copper piping with gauge panel boards.
<b>6 B</b>	<b>Controls</b>					
	i) Expansion valves	6	5 TR	Danfoss		
	ii) HP/LP Cut outs	6		Honeywell controls	YK 306	
	iii) Digital Temperature transmitter	3				
	iv) Refrigerant pres. gauges	6		H. Guru / Fiebig		HP-2 nos, LP-2 nos,
	v) Chiller diff. Press. Switches	3		Indfoss	IPSD-50	
	vi) Water press. Gauges	6		H. Guru/ Fiebig		4" dial type
	xii) CCH	6	200 Watts			1 no. In each compressor
6 C	Chilled Water Pumps for LVPD & First Wall System	4	1 HP	CG	2850 rpm	All are Monoblock pumps. 2 nos. working and 2 no. Standby
6 D	Chilled Water Pumps for ECRH cooling system	2	1 HP	KCL	2900 rpm	All are Monoblock pumps. 1 nos. working and 1 no. Standby



6 E	Chilled water insulated piping	3	Lot			This covers entire interconnected water piping between above listed all equipments like chillers, pumps, experimental devices etc.. Also, this will cover all necessary fittings and controls mounted in the piping like NRVs', BFVs', Y-strainers, pressure and temp. Gauges purge valves, flow switches, fitted in the piping of the all three plants (First face wall experiment, LVPD and ECRH experiment Device)
6 F	Local Control panel for Plant	3	No		Floor mounted type	Starter panel for above three plants with all electrical, mechanical & electronic, parts/controls and other accessories installed in side the panel and in SST1 hall, with all internal/external wiring (control, power and earthing)
<b>7</b>	<b>Chiller Package unit for Vacuum Furnace experiment Device Location: Out side of Pump House</b>					
7 A	Chiller Package Unit (Industrial Water Cooler type) consists of following equipments:	1	10 TR	Air Tech Engineers		For cooling of Vacuum furnace.
	i) Compressor	1	10 TR	Copeland	Model-ZR12M3-TWD-551	R-22 based sealed scroll type compressor.
	ii) Condenser	1				Air cooled tube and fins type
	iii) PHE (SS Plate type heat exchanger)	1			DX	This PHE installed in chiller package and connected to in build tank is having capacity of 200 liters water storage.
	iv) Refrigerant piping	1 set				This includes shut off valves, drier, filters, site glass and copper piping with gauge panel boards.



	v) Condenser fan motor	3		CG	410 W	This includes the fan blade and motors.
7 B	<b>Controls</b>					
	i) Expansion valves	1	10 TR			
	ii) HP/LP Cut outs	1				
	iii) Digital Temperature transmitter	1				
	iv) Refrigerant pres. gauges	2		H. Guru / Fiebig		HP-1 nos, LP-1 nos,
	v) Chiller diff. Press. Switches	1				
	vi) Water press. Gauges	3		H. Guru/ Fiebig		4" dial type
	xii) CCH (Heater)	1				
7 C	Chilled Water Pumps	1	5 HP	KBL		Mono block pumps.
7 D	Chilled water insulated piping	1	Lot			This covers entire interconnected water piping between above listed all equipments like Tank, pumps, PHE and experimental devices etc.. Also, this will cover all necessary fittings and controls mounted in the piping like NRVs', BfVs', 3 way diverting valves, solenoide valves, Y-strainers, pressure and temp. Gauges, purge valves, flow switches, fitted in the piping of the plant.
7 E	Local Control panel for Plant	1	No		Inbuilt	Starter panel for above plant with all electrical, mechanical & electronic, parts/controls and other accessories installed in the package with all internal/external wiring (control, power and earthling)
8	<b>Chiller Package unit for LASER experiment Device</b> <b>Location: Outside Laser Lab, SST1 Building</b>					
8 A	Chiller Package Unit (Industrial Water Cooler type) consists of	1	15 TR	Air Tech Engineers		For cooling of LASER experiment Device.



	following equipments:					
	i) Compressor	3	5 TR	Kirloskar	Model-KCG-562 HAE	R-22 based sealed reciprocating type compressor.
	ii) Condenser	1				Air cooled tube and fins type
	iii) PHE (SS Plate type heat exchanger)	3			DX	This PHE installed in chiller package and connected to in build tank is having capacity of 200 liters water storage.
	iv) Refrigerant piping	3 set				This includes shut off valves, drier, filters, site glass and copper piping with gauge panel boards.
	v) Condenser fan motor	4		CG	410 W	This includes the fan blade and motors.
8 B	Controls					
	i) Expansion valves	3	5 TR			
	ii) HP/LP Cut outs	3				
	iii) Digital Temperature transmitter	1				
	iv) Refrigerant pres. Gauges	6		H. Guru / Fiebig		HP-3 nos, LP-3 nos,
	v) Chiller diff. Press. Switches	3				
	vi) Water press. Gauges	3		H. Guru/ Fiebig		4" dial type
	xii) CCH	3				1 no. In each compressor
8 C	Chilled Water Pumps	1	3 HP	Grundfos		Mono block pumps.
8 D	Chilled water insulated piping	1	Lot			This covers entire interconnected water piping between above listed all equipments like Tank, pumps, PHE and experimental devices etc.. Also, this will cover all necessary fittings and controls mounted in the piping like NRVs', BFVs', Y-strainers, pressure and temp. Gauges, purge valves, flow switches, flow meter fitted in the piping of the plant.



8 E	Local Control panel for Plant	1	No		Inbuilt	Starter panel for above plant with all electrical, mechanical & electronic parts/controls and other accessories installed in the package with all internal/external wiring (control, power and earthing)
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9	Air cooled Package unit for Control room of Aditya Hall	1	10 TR	Blue Star	PAA-1028	A package unit consists of 2 nos. individual 5 TR refrigerant circuits with 2 nos. Sealed compressors, Air-cooled condensers, cooling coil, blower unit, drive package, pre filters, and interconnected refrigerant piping with safety/controls, electrical panel with power & control wiring and earthing. S.A/R.A ducts, grilles, insulation, canvass, fire dampers, smoke detectors.
10	Air cooled Package unit for APPS Hall	2	10 TR	Blue Star	PAA-1028	As mentioned above. This covers also a Main electrical panel with 100 amps incomer SFU and separate feeder for each unit.
11	Air Cooled Package unit for Computer Hall-Mezz. Floor	1	10 TR	Batliboi	BBIOAC5M	As mentioned above. This covers also a Main electrical panel with 100 amps incomer SFU and separate feeder for each unit.
12	Air Cooled Package unit for Computer Hall	4	10 TR	Batliboi	BBIOAC5M	A package unit consists of 2 nos. individual 5 TR refrigerant circuits with 2 nos. Sealed compressors, Air-cooled condensers, cooling coil, blower unit, drive package, pre filters, and interconnected refrigerant piping with



						safety/controls, electrical panel with power & control wiring and earthing. S.A/R.A ducts, grilles, insulation, canvass, fire dampers, smoke detectors. This includes the main electrical panel with 250 amps incomer MCB and different feeders for each unit.
13	Air Cooled Package unit for R.F. Lab.-Ground & First Floor	1 1 2	10TR 15 TR 7.5 TR	Blue star	DPA-1202 DPA-1803 DPA-901	Package units consists of Sealed compressors, Air cooled condensers, cooling coil, blower unit, drive package, pre filters, interconnected refrigerant piping with safety/controls, electrical panel with power & control wiring and earthing. S.A/R.A ducts, grilles, insulation, canvass connections.  Note: 10 TR Package has 2 circuits of 5TR with 2 nos. compressors, 15 TR Package has 3 circuits of 5 TR with 3 nos. sealed compressors, where as in 7.5 TR Package single circuit with single sealed compressor of 7.5 TR.
14	Air Cooled Package units for Administration and Purchase section	2	15 TR	Fedders Lloyd	P25EK99/	Package units consists of Sealed compressors, Air cooled condensers, cooling coil, blower unit, drive package, pre filters, interconnected refrigerant piping with safety/controls, electrical panel with power & control wiring and earthing. S.A/R.A ducts, grilles, insulation, canvass connections.



						Note: Each Package has 2 circuits of 7.5 TR with 2 nos. sealed compressors. This includes the main electrical panel with 100 amps incomer MCB and different feeders for each unit.
15	Air washer Unit for canteen	1	12000 CFM	Batlilboi		This unit consists one no. AHU of 1200 cfm with FRP air washer. Air washer is made of cooling fills and nozzles. this includes S.A. ducting, grilles, prefilters, small water tank, float valve, 2 HP pump and connected water piping and necessary valves/fittings with one no. Control panel, power cabling/earthing.
<b>16</b>	<b>Ventilation Systems for various plant rooms / Utility Halls / Cryogenic Hall/ He-Compressor Hall</b>					
16A	Ventilation System for KBAC plant room	1	6000 CFM	PAT		This ventilation system is for the plant room only. This consists of one no. Centrifugal blower unit, 5 HP/ 4P motor with pre filters, S.A. insulated ducting, diffusers/grilles, canvass connection, 2 nos. exhaust fans of 1 HP with local control panel, power cabling/earthing.
16 B	i) Ground Floor of Utility Building	2 sys	20000 cfm	Patel Airtemp	PB-84	A complete set of centrifugal blower with 10 HP motor, belt drive package, fresh air filters, ducting, grilles, fire dampers with limit switch, ionized type smoke detector with fire alarm panel and wall mounted electrical panel houses the feeder for the motor with all electrical, mechanical & electronic, parts/controls and



						other accessories installed in side the panel, with all internal/external wiring (control, power and earthling)
	ii) First Floor of Utility Building	2sys	17500 cfm	Patel Airtemp	PB-84	As mentioned above
	iii) First Floor of Utility Building	1 sys	16000 cfm	Patel Airtemp	PB-75	As mentioned above
	iv) Screw Chiller plant room	1 sys	11000 cfm	Patel Airtemp	PB-62	As mentioned above but with 7.5 HP motor.
16C	Ventilation System for He-Compressor plant room	1	40000 CFM	ACCEL	Fan Model: CF-42 DIDW	A complete set of centrifugal blower with 30HP motor, belt drive package, fresh air filters, ducting, grilles, fire dampers with limit switch, ionized type smoke detector with fire alarm panel and wall mounted electrical panel houses the feeder for the motor with all electrical, mechanical & electronic, parts/controls and other accessories installed in side the panel, with all internal/external wiring (control, power and earthling)
16D	Roof Extractors for exhaust					
	i) First floor of Utility Building	11	600mm dia	Patel Airtemp	DH-62	Fans are mounted at the terrace of Utility Bldg.
	ii) Cryogenic Hall	6	750 mm dia	Patel Airtemp	DH-75	Fans are mounted at the terrace of cryogenic Bldg.
16E	Exhaust Fans					
	i) Ground Floor of Utility Building	27	300 mm dia	GEC Alstom	GPMN-38061	Used for the exhaust of entire hall
	ii) Screw Chiller Plant room	4	380 mm dia	GEC Alstom	GPN-45061	Used for the exhaust of the plant room
	iii) He-Compressor Plant room	10	4000 CFM	GEC	GPN-45061	For exhaust air from the plant.



	iv) SST Water Cooling Plant room	11	300 mm dia	GEC Alstom	GPMN-38061	For exhaust air from the plant.
16 F	Electrical Panels for above equipments					
	i) Local Control panel for Ventilation systems mentioned as item no. 14 A & 14 B	7			Wall mounted type	Starter panel for Blower motor with all electrical, mechanical & electronic, parts/controls and other accessories installed in side the panel, with all internal/external wiring (control, power and earthling)
	ii) Local Control panel for Ventilation systems mentioned as item no. 14 C	1			Wall mounted type	It houses feeders for fan motor including incomer SFU with all electrical, mechanical & electronic, parts/controls and other accessories installed in side the panel, with all internal/external wiring (control, power and earthling)
	iii) Local Control panel for First floor of Utility Building	1			Floor mounted type	It houses feeders for 11 nos. roof extractors (of utility first floor) with all electrical, mechanical & electronic, parts/controls and other accessories installed in side the panel, with all internal/external wiring (control, power and earthling)
	iv) Local Control panel for Roof extractors Cryogenic Hall	1			Wall mounted type	It houses feeders for 6 nos. roof extractors (of Cryogenic Hall) with all electrical, mechanical & electronic, parts/controls and other accessories installed in side the panel, with all internal/external wiring (control, power and earthling)
17	<b>D.M. Water Cooling Plants for various Cooling Systems</b>					



Location: TBAC Plant room						
17A	Cation-Anion Unit	1	10 C.M	Ion Exchange	CAU-320	<p>This unit generates D.M. water of &lt;30 microS , which is used through M.B. Unit to the various experimental devices as a secondary cooling media. This includes all interconnected piping, valves, instruments like rotameter, conductivity meter, pH meter, Digital level indicator, sensors, gauges and necessary controls etc, with up flow filer.</p> <p>Note: The operating and maintaining of the system will be in the scope of the successful AMC contractor. The regeneration of the unit shall be carried out by IPR as and when required.</p>
17 B	Cation-Anion Unit	1	30 CM	Ion Exchange	CA-600	<p>This unit generates D.M. water of &lt;30 microS, which is used through M.B. Unit to the various experimental devices as a secondary cooling media. This includes all interconnected piping, valves, Degasser, air blower and Neutralizing pumps, instruments like rotameter, conductivity meter, sensors, gauges and necessary controls etc, with up flow filer</p> <p><b>Note: The operating and maintaining of the system will be in the scope of the successful AMC contractor. The regeneration of the unit shall be carried</b></p>



							<b>out by IPR as and when required.</b>
17C	Mixed Bed Unit	1	45 CM	Ion Exchange	MB-1000		<p>This unit maintains the conductivity of D.M. water 1microS. The water coming from Cation- Anion unit is circulated through Mixed Bed unit before passing to various experimental devices. This includes all interconnected piping, valves, instruments like rotameter, conductivity meter, Ph meter, sensors, gauges and necessary controls etc.</p> <p><b>Note: The operating and maintaining of the system will be in the scope of the successful AMC contractor. The regeneration of the unit shall be carried out by IPR as and when required.</b></p>
17D	Raw water Pump	2	2 HP				With coupled motor. These are meant for feeding water to the inlet of Cation-Anion unit. This will include interconnected piping, valves, gauges etc.
17 E	DM Water Pump for LVPD	2	15 HP	Johnson			This is for the circulation of D.M. water from storage tank to LVPD experimental set ups through PHE. Pump is with 15 HP/2P motor, drive packages.
17 F	DM Water Pump for Cryogenics	2	25 HP	KBL			This is for the circulation of D.M. water from storage tank to cryogenics helium compressors cooling through PHE. Pump is with 25 HP/2P motor, drive packages.
17G	D.M. Make up water pumps	1	3 HP	Johnson	CCR 25-160		These are used for make up of D.M.



						water Make up tank. These pumps are coupled type with 3 HP motor and drives set.
17H	Drain water pump	1	2 HP	Beacon	1-1/2 DM6 LD162	This is Monoblock type pump and is used to drain out water from the pit at TBAC plant.
17I	D.M. Water storage tank for Aditya, LVPD & Cryogenic experimental devices.	1	45000 Liters		Made out of SS sheet, cubical type	This tank has a partition in to two. 15000 liters for Aditya and 30,000 liters for LVPD & Cryogenic D.M. Water Storage.
17J	D.M. Make up tank for Aditya D.M. water storage tank	1	2000 liters		Made out of SS sheet, cubical type	This is used for the make up of Aditya storage tank. This shall include all necessary fittings, valves, glass indicator with inter connected SS piping.
17K	D.M. Make up tank for R.F experiments' D.M. Water storage tank	1	1000 liters		Made out of SS sheet, cubical type	This is used for the make up of D.M. water storage tank made for R.F experimental devices. This includes all necessary fittings, valves; Digital Level indicator with inters connected SS piping.
17 L	D.M. water and cooling water MS & SS piping	Lot				This covers entire Interconnected water piping between above listed all equipments like CTs', heat exchangers, experimental devices etc. This will cover all necessary fittings and controls mounted in the piping like Gate & Globe valves, BFVs', NRVs', Pot strainers, Y-strainers, pressure and temp. Gauges, purge valves, flow switches, Pressure regulating valves, float valves, etc. fitted in the piping of the plants.  Note: This includes SS piping, fittings, valves, and flow meters with



						display units, temperature and press. Gauges fitted in the DM water circulation system meant for LVPD, Aditya and Cryogenic cooling systems
<b>18</b>	<b>Soft Water Plant for Water Cooling Plants Location: Near Overhead Water Tank</b>					
18A	Soft water plant	2	30 CM	Doshion		It generates soft water, which is circulated through cooling water lines to the various A.C. Plants. This includes entire interconnected piping, valves, tanks, instruments, gauges, level indicators in the tanks regenerates and consumables for regeneration.  Note: The operating and maintaining of the system will be in the scope of the successful AMC contractor. The regeneration of the unit shall be carried out by IPR as and when required.
18 B	Raw water Pumps	5	30 CM	Mather Platt +	Back pullout	The pump feeds water from raw/Fire water tank to soft water plant. Connected with 10 HP/4P/ABB motor, interconnected water piping, valves, NRVs', strainers, gauges etc.
18C	Soft Water Pumps	2	60 CM	Mather Platt +	Back pullout	The pump feeds water from soft water tank to overhead RCC tank. Connected with 15



						KW/4P/Siemens motor, interconnected water piping, valves, NRVs', strainers, gauges etc.
18D	Drain Pump	1				The submersible pump of 1 HP for drain the water from water pit in the pump house
18E	Soft Water MS/ GI piping	Lot				This covers entire interconnected water piping between above listed pumps, storage and raw water tanks and Soft water plant etc. Also, this will cover all necessary fittings and controls mounted in the piping like Gate & Globe valves, NRVs', BfVs', strainers, pressure and temp. Gauges purge valves, flow switches etc. fitted in the piping of the plants.
18 F	Local Control panel	1			Floor mounted type	Starter panel for 5 nos. raw water, 2 nos. soft water pumps and one submersible pump motors with all electrical, mechanical & electronic, parts/controls and other accessories installed in side the panel, with all internal/external wiring (control, level sensor & switch, power and earthing)
18G	Status indication panel	1			Floor mounted type	This indicates the status of raw water and soft water pumps and the level of soft water, over head tanks with remote ON/OFF facilities with all electrical, mechanical & electronic, parts/controls and other accessories installed in side the panel, with all internal/external wiring (control, level



						sensor & switch, power and earthling)
<b>19</b>	<b>R.F. Cooling systems</b> <b>Location of plant: TBAC Plant room</b>					
	D.M. Water cooling system for R.F. lab. Various experimental set ups like (ICRH, ECRH, Upper and lower body systems)	1 set	240 KW			Note: The operating and maintaining of the system will be in the scope of the successful AMC contractor. The regeneration of the MB unit shall be carried out by IPR as and when required. IPR will coordinate with Operation Supervisor of successful tendere for operation of RF Cooling system.
19A	D.M. Water pumps	2	2.2 KW	Johnson	CCR 32-160 R6M2L3	This is for the circulation of D.M. water through Mixed Bed unit to D.M. Water storage tank. Pump is with 3 HP/4P motor, drive packages.
19 B	D.M. Water pump	1	10 HP	Johnson	CCR50-200 R6M2L3	This is for the circulation of D.M. water through Mixed Bed unit to D.M. Water storage tank. Pump is with 10 HP/4P motor, drive packages.
19C	D.M. Water pumps	2	30 HP	Johnson	CCR 65-200 R6M2L3	This is for the circulation of D.M. water from storage tank to various R.F. experimental set ups through PHE. Pump is with 30 HP/4P motor, drive packages.
19D	D.M. Water pumps with single VFD unit	2	60 HP	Johnson	CCR 80-250 R6M2L3	This is for the circulation of D.M. water from storage tank to various R.F. experimental set ups through PHE. Pump is with 60 HP/4P motor, drive packages and operated through Variable Speed Drive unit from 0 to 50 Hz frequency to control the flow across various exp. devices.
19	S.S Water	1 lot				This includes all



E	Piping					interconnected SS piping between pumps, tanks, PHE, and various experimental set ups along with all necessary fittings, valves like BFVs', NRVs', strainers, flow meters with display unit and sensors, rotameter, pressure and temperature gauges etc.
19 F	Cooling water pumps	2	11 KW	Cromp. & Greaves	MBR 15.2 D	These are Monoblock type pumps required to circulate cooling water as a primary media through PHE to cool down the D.M. water. This includes the entire interconnected M.S. piping between cooling towers and PHE along with all necessary fittings and controls mounted in the piping like Gate & Globe valves, NRVs', BFVs', Pot strainers, Y-strainers, pressure and temp. Gauges purge valves; float valves, etc. fitted in the piping of the plants.
19G	Drain water Pump	2	2 HP	KBL	SP-1MM	This is Monoblock type pump and is used to drain out water from the pit of D.M. Water Pumps.
19H	Mixed Bed Unit	1	250 LPH	Ion-Exchange	MB-600	This unit is used to maintain the conductivity of D.M. water < 1 mS. This unit includes Air blower, resin tank, interconnected rubber lined piping, valves/fittings, Digital conductivity indicator, sensors, level indicator, rotameter etc.  <b>Note: The regeneration of the unit shall be carried out by IPR as and</b>



						<b>when required.</b>
19 I	De-Oxygenation unit	1	250LPH	Ion-Exchange	350CM	<p>This unit is used to maintain the oxygen content of D.M. water &lt; 0.5 ppm which is required to be circulated through some experimental set ups This unit includes the main tank with interconnected piping, valves/fittings, Digital indicator, sensors, rotameter , motorized stirrer etc.</p> <p><b>Note: The regeneration of the unit shall be carried out by IPR as and when required.</b></p>
19 J	Electrical panel for above plant	1				<p>This is the main electrical panel with incomer as 250 amps MCCB and feeders for various D.M.Water pumps listed above with annunciation cum indication panel, all electrical, mechanical &amp; electronic, parts/controls and other accessories installed in side the panel, with all internal/external wiring (control, power and earthling)</p>





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## PLANTS MAINTENANCE SCHEDULE

(For equipments covered under item S.No. 1 to 19)

### 1a. OPEN / SEMI HERMETIC COMPRESSOR (RECIPROCATING TYPE)

#### Daily:

- Cleaning
- Checking lubrication oil (level & leakage) and maintain the level by make up.
- Checking operating parameters

#### Monthly:

- Check condition and alignment of compressor drive set.
- Lubricate motor bearings (quarterly)
- Check operation of safety controls, shut off valves / angle valves and instruments

#### Yearly:

- Inspect oil for discoloration or contamination after initial charges as per manufacturers
- The Lubricating oil to be change every year preferably during winter maintenance.

**Repairs:** The Seal assembly, Supply and discharge valves, Items involved in stoppage of refrigerant / oil leakages, Expansion valves can be repaired and made functional. If they are found not repairable, then need to be replaced by the contractor with new one.

**Replacement of Items:** The following items, if found faulty need to be replaced by the contractor with new one –

Suction valve spring, connecting rod bearing inserts, main bearings, cylinder sleeves, various rings, gasket sets, O ring sets, aluminum packing set, suction disc, star washer, seal cover plate, DV disc, DV guide assembly, DV spring, valve plate, oil pump assembly, DV guide lock washer, piston pins, piston pin lock rings, Connecting rod assembly, regulating valve, oil filter, felt filters, various brass & thrust washers, loading / unloading fork with piston assembly, hydraulic relays, internal lubrication tubing, capacity control valve, belt, sight glass, etc

**Note:** Repairs or replacement of Crankshaft and crankcase of compressor will not be in the scope of contractor.

### 1b. HERMETIC COMPRESSOR (SCREW / RECIPROCATING TYPE)



**Daily:**

- Cleaning
- Checking lubrication oil (level & leakage) and recharging
- Checking operating parameters

**Monthly:** Check operation of safety controls & instruments and

**Yearly:**

- Inspect oil for discoloration or contamination.
- The Lubricating oil to be change every 2 year preferably during winter maintenance.

**Repairs:** The Motorized valves can be repaired and made functional. If they are found not repairable, then need to be replaced **by the contractor** with new one.

**Replacement of Items:** The following items, if found faulty need to be replaced **by the contractor** with new one –

The Sight glass, solenoid valves, NRV etc.

**Note:**

1. In case of failure of sealed reciprocating compressor, the faulty compressor has to be replaced by factory-repaired compressor **by the contractor**. However, final acceptance of any repaired / replaced compressor by the contractor shall be decided by the designated engineer / Section Head/ Division Head / Project Leader after testing in the respective system at IPR. In case the original manufacturer do not exist or model is changed, then the other available compatible makes or model of the compressor shall be got approved from the concerned engineer or Section Head/ Division Head /Project Leader and installed at no extra cost.
2. **Repairing of screw compressor will not be in the scope of contractor. However, necessary labor required to carry out the work like dismantling faulty compressor from the skid, refitting the repaired compressor, pressure testing and re-commissioning the system after repairs with the supply of gas and oil shall be under the scope of contractor.**

## **2. CONDENSER / EVAPORATOR OF ALL CHILLING PLANTS & AC PACKAGES AND COOLING COILS OF AHUS**

**Daily:** Check entering and leaving water temperatures, refrigerant pressures and all others parameters.

**Monthly:** Check cooling tower water being circulated for the suspended particles, algae formation, if. Find so; refill the circuit with fresh water.

**Yearly:**

- Check tubes and if require, clean with detergent twice in a year. Otherwise, descaling shall be carried out by the contractor using special chemicals.
- Check pressure setting of safety control switches.
- Drain the chilled water and refill the water system with air purging
- Check for operation of safety valves.

**Repairs:** The following items can be repaired and made functional by the contractor. If they are found not repairable, then need to be replaced by the contractor.

- All types of valves including gate, butterfly, globe, ball, diverting, balancing, float, needle, angle, shut off valves
- Welding/brazing of leakage points, minor leaks etc.



**Replacement:** The water box gaskets have to be replaced by the contractor, whenever head is opened for brushing / descaling

**Note:** The repairs or replacement of damaged shell or body of the heat exchanger will not be in the scope of contractor. If more than 10 tubes are found leaked in the shell, the same shall be repaired or replaced by IPR.

### **3. ALL PUMPS (CONDENSOR, CHILLERS, PROCESS, WATER TREATMENT PLANT, ETC )**

**Daily:** Check packing and mechanical seals for leakage

**Monthly:**

- Check the alignment and conditions of coupling to prevent damage to shaft and impeller
- Lubricate bearings with grease gun.
- Replace gland thread if required
- Check lubricant oil level / make up the oil (in case of oil lubricated pumps)

**Yearly:**

- Inspect shaft, shaft sleeves, bearing, bearing housing etc.
- Over hauling of all pumps. At the time of overhauling, the damaged parts need to be replaced by the contractor

**Repairs:** The Impeller and shaft can be repaired and made functional. If they are found not repairable, then need to be replaced by new one by the contractor.

**Replacement:** The Packing, mechanical seal, bush, bearing, Shaft sleeves, coupling etc. if found faulty need to be replaced with new one by the contractor.

**Note:** The repairs or replacement of damaged casing of pump will not be in the scope of contractor.

### **4. INSTRUMENTS & CONTROLS**

- Monthly checking of operation of all controls, sensors, measuring devices, electronic control cards etc.
- Readjustment of control if necessary

**Repairs:** Motorized valves, flow meter with sensor & display, conductivity meter with sensor & display, pH meter with sensor & display, modulating valve with actuator, oxygen meter with sensor & display, rotameter can be repaired and made functional. If they are found beyond repairable, then need to be replaced by new one by the contractor.

**Replacement:** The items- Refrigerant level sensor, water level sensor, photo sensor, pressure transducer, rheostat, temperature controller with sensor and display, thermocouple, temperature gauge, sight glass, solenoid valves, pressure gauge, oil safety switch, HP/LP cut out, DP switch, flow switch, crank case heater, thermostatic expansion valve, thermostat (operating & antifreeze) smoke detector, air stat, safety valve, limit switch, humidistat, etc if found faulty need to be replaced with new one by the contractor.

#### **5a. REFRIGERANT PIPING:**

**Monthly:** Check for leaks at the joints with soap test.

**Yearly:**

- Check valves for wear at the valve disc and seat.
- Check the insulation for breaks in the vapour barrier, and other possible locations.



**Repairs:** Refrigerant piping can be repaired and made functional. If it is found beyond repairable, then need to be replaced by new one **by the contractor**.

**Replacement:** The items- check valves in Refrigerant piping, if found faulty need to be replaced with new one **by the contractor**.

#### **5b. WATER PIPING (MS & SS - BOTH ABOVE AND UNDR GROUND PIPINGS)**

**Daily:** Check for leakages.

**Monthly:**

- Check for leaks at the joints.
- Clean Y-Strainers & pot strainers.

**Yearly:**

- Check for the damage in insulation
- Checks for the rusting in the pipes
- Check valves for wear at the valve disc and seat
- Cleaning of pipe header from inside by opening end cover / flange

**Repairs: (for both 5a & 5b):** The following items can be repaired and made functional. If they are found beyond repairable, then need to be replaced by **new one by the contractor**.

- All types of valves including gate, globe, ball, butterfly, non-return, balancing, float, purging, needle valves.
- Insulation break in piping, tank, etc.
- Leakages in flanges, joints and fittings, valve glands / seat and pinholes in piping & storage/expansion tanks have to be repaired. If replacement of flanges, gaskets, glands/ seat and fittings are required, it will be in contractor's scope.

**Note: Replacement of water piping (MS & SS - BOTH ABOVE AND UNDR GROUND PIPINGS) more than 10 meters and valves of above 50 NB sizes will not be in the scope of contractor.**

#### **6a A.H.U. / CENTRIFUGAL BLOWERS / ROOF EXTRACTORS/ EXHAUST FANS/ BLOWER UNIT OF PACKAGE AC UNITS**

**Monthly:**

- Check condition of drive coupling, sleeves. Belts, pedestal bearings and alignment
- Check condition of vibration isolators.
- Check proper locking of inspection doors and their leakages.
- Clean Air filters, check for proper drainage of condensate

**Yearly:**

- Inspect housing and wheel for rust and accumulation of dirt / suspended particles.
- Check fan wheel for damage and evidence of cracks of the blades
- Check bearings for wear and apply fresh lubricant
- Check and tighten mounting bolts
- The drain tray of all AHU units should be painted once in a year with two coats of synthetic enamel paint or as and when required by IPR.

**Repairs:** Shaft, Canvass connection, belt guard, filter frame, blower can be repaired and made functional. If they are not repairable, then need to be replaced by new one **by the contractor**.



**Replacements**

The faulty Belt, bearing, shaft sleeves, runner / fan blade/ impeller of package unit, vibration isolator, air filters, drive packages etc. if found faulty, need to be replaced with new one **by the contractor**.

**Note: Repairs or replacement of damaged housing of AHU / Centrifugal blowers / roof extractors/ exhaust fans/ blower unit of package AC will not be in the scope of the contractor.**

**6b DUCT/ DAMPERS (FIRE/VOLUME CONTROL) & GRILLS**

- Check for any air leakage in the duct
- Check for any insulation damage for ducts.
- Check for disconnected and loose linkages
- Check for functional operation of dampers and grilles. Lubricate pins of dampers, grilles, wherever required.
- Check louvers for any damage and cleaning shall be followed

**Repair:**

- Repairing in the duct as per standard practice like riveting the joints, provided felt or gasket in the joints, patch work in the duct, insulation of the duct etc. If insulation of the duct gets damaged, the contractor shall rectify/ replace insulation for proper functioning.
- Canvass / damper / grills

**Note: Repairs or replacement of damaged housing of dampers (fire/volume control) and grills will not be in the scope of the contractor.**

**7. COOLING TOWER:****Daily:**

- Cleaning
- Check for operation of float valve, quick fill valve, equalizer connection

**Monthly:**

- Check cooling water being circulated for the suspended particles, algae formation, if. Find so; refill the circuit with fresh water.
- Drain the water and clean the sump of cooling tower
- Clean pot strainer/Y-strainer
- Check the condition of fills, if required, clean the fills with detergent
- Check for operation of shut off valves.
- Check for belt tension, oil level in the gearbox assembly.

**Repairs:**

The following items can be repaired and made functional. If they are found not repairable, then need to be replaced new one **by the contractor**.

- Water line leakage.
- All types of valves including float valve, quick fill valve, drain valve, etc.
- Gear box, strainer, eliminators
- Repairs of FRP panel / basin.

**Replacement**

The following item, if found faulty, need to be replaced with new one **by the contractor**.

- Bearings, Blades of fan, fills, nozzle, distribution channels,

**NOTE: Repairs or replacement of damaged housing of cooling tower will not be in the scope of contractor.**



**8. FAN COIL UNIT:****Quarterly:**

- Cleaning air filter, strainer.
- Motor bushing oiling
- Cleaning drain pan & tray
- Check for the operation of fan speed regulator
- Check for the drainage of condensate.

**Yearly:**

- Cleaning of cooling coil by wire brush.

**Repairs**

The following items can be repaired and made functional. If they are found beyond repairable, then need to be replaced by new one by the contractor.

- Water line leakages
- Welding, brazing & flaring
- Fan motor rewinding
- Drain pan, motor mounting arrangement, insulation of chilled water line and drain line

**Replacement:** Strainer, runner bearings, bushings, connector strips, capacitors, selector switch, inlet / out let valves, if found faulty, need to be replaced with new one **by the contractor**.

**Note: Repairs or replacement of damaged housing of unit will not be in the scope of contractor.**

**9 ELECTRICAL MAINTENANCE:****9a MOTOR (COMPRESSOR, PUMP, AHU, FCU, BLOWER, COOLING TOWER, DEGASSER):****Daily:**

- Cleaning of motor

**Quarterly:**

- Lubricate bearings.
- Check for proper glanding & tightness of connections

**Yearly:**

- Dismantle the motor and apply grease on the bearings. Check for cleanliness of air passages, windings, remove dust dirt and grease, which may cause Flashing.
- Inspect visually the starter windings and measure insulation resistance.
- Inspect coil condition in the slots, condition of wedges and movement and evidence of coil looseness
- Inspect coil condition in the end winding, coil surface, distortion and insulation swelling
- Inspect rotor for cracked bars and rings for correction to bars
- Check air gap uniformity and record as indication of bearing wear

**Repairs:** The Rewinding of motor, Rotor & stator can be repaired and made functional. If they are found not repairable, then need to be replaced **by the contractor**.

**Replacements:** Bearings, Shaft sleeves, Cooling fan, Gland, Terminal box, Glands, Studs & Lugging, if found faulty, need to be replaced with new one **by the contractor**.

**Note: Repairs or replacement of damaged casing of motor will not be in the scope of contractor.**



**9b ELECTRICAL PANELS (POWER, ANNUNCIATION, FIRE, MICROPROCESSOR PANEL OF SCREW CHILLER) AND THEIR CABLING & WIRING:****Daily:**

- Check for any tripping, chattering in the electrical parts, abnormal noise, overheating in the panels
- Check whether indication lamps are working
- All circuit boards for healthy contact minor repairs/services/cleaning etc.

**Monthly:**

- Check for the proper working of all ammeters, voltmeters, Hour meters, KWh meters, overload relays, contactors malfunction etc.
- Clean the panels from inside with the help of the blower/ vacuum cleaners (Quarterly)
- Check all the cables for overheating, tightness of the glands, lugs & crimping.
- Check the fuse-link & fuse holders.
- Check the control wiring of the panel along with the controls for the proper functioning and tripping at the preset parameters.
- Check and maintain the soft starter, Microprocessors panel of Screw chiller packages.
- Check and maintain variable speed drives for RF cooling pumps

**Yearly:**

- Check the operation of MCCB, MCB, Isolators, SFU and servicing of the same.

**Repairs:** MCCB, isolators, Contactors, Bus bar, Cable termination with glands, Various electronic cards like AO, AI, DO, DI, AM & motherboards can be repaired and made functional. If they are found not repairable, then need to be replaced by the contractor.

**Replacements:** Fuse links, MCB, overload relay, single phase preventor, push buttons, indicating lamps, voltmeter, ammeter, kWh meter, no volt coils, selector switches, solenoid valves, fuse holders, relays, timer, limit switches, cooling fans, capacitors, etc. items if found faulty, need to be replaced with new one by the contractor.

**Note:** Repairs or replacement of damaged body of the panel will not be in the scope of the contractor.

**10. AIR COOLED PACKAGE UNITS:****Daily:**

- Check operating parameters on control panel

**Monthly:**

- Inspect fan motor drive, check tension of V-Belt, electrical connections etc.
- Check operating parameters and the operation of all controls.
- Lubrication, wherever necessary

**Yearly:**

- The drain tray of all packaged units should be painted once in a year with two coats of synthetic enamel paint or as and when required by IPR.
- Please refer earlier description covered for compressor, condenser, and blower, cooling coils, refrigerant piping and electrical maintenance.

**Repairs and Replacements:**

- Repairs or Replacements will be applicable whenever required, as mentioned under compressor, evaporator & condenser, instruments and controls, pumps, piping, blowers, electrical maintenance etc. All such repair or replacement **in the contractor's scope**.



**11. WATER TREATMENT PLANTS INCLUDING DM WATER PLANTS, MIXED BED UNITS, DEOXYGENATION UNIT, WATER SOFTENING PLANTS:****Daily:**

- Check for operating parameters.

**Monthly:**

- Check for cleanliness of stirrer, HCL regeneration container etc.
- Check the operation of all valves / controls like, gauges, sensors, conductivity meter, level indicator, oxygen content indicator etc.
- Check proper working of air blower and degasser unit

**Yearly:**

- Check the condition of resins.
- Check the condition of various valves, pumps & piping.

**Repairs and Replacements:**

- Repairs and Replacements will be applicable whenever required, as mentioned under pumps, blowers, instruments and controls, piping, electrical maintenance etc. All such repair or replacement in the **contractor's scope**.

**12. GENERAL TERMS & CONDITIONS, APPLICABLE TO ALL PLANTS:**

1. It is to be noted that **any damage occurs due to faulty operation or maintenance of the contractor** in the plant, the contractor has to carry out necessary repair with the supply of parts, consumables within minimum possible downtime and made functional. If they are found not repairable, then the same needs to be replaced **with new one without any extra cost**. This will be applicable to all equipments, instruments and controls covered in the scope of contractor as well as those equipments, instruments and controls which are part of the plant but not covered **in the scope of contractor**.
2. Notwithstanding as to what is specifically stated under PLANT MAINTENANCE SCHEDULE, it shall be responsibility of the successful tenderer to attend to all the preventive & routine maintenance and repairs and breakdown services including replacement of necessary parts and components.
3. **Pumps, motors, piping, Instruments and controls, MB unit, De-Oxygenation unit, Electrical Panel etc:** Necessary repairs and replacement will be carried out **by the contractor** as per the details mentioned in Maintenance Schedule elsewhere in the document.
4. **For Plate Heat Exchanger:** if leakages found in the PHE, the necessary repairs will be carried out **by the contractor** with the help of manufacturer (if required) without any extra cost.





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**Part – A [ii]**

**Consisting of  
General Conditions, Instructions to Bidders  
and Terms and Conditions**

(Page No. 51 to 59)





प्लाज़्मा संशोधन संस्था  
प्लाज़्मा अनुसंधान संस्थान  
INSTITUTE FOR PLASMA RESEARCH

निकट इन्दिरा पुल, भाट, गांधीनगर 382 428 (भारत)

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**TENDER NOTICE No.IPR/ST/TN-OMC/02/2008 DATED 30/11/2008**

(IN TWO PARTS)

**GENERAL CONDITIONS**

1. This is a **two part tender**. Kindly submit **Technical Bid & Terms and Conditions**, given as Part A {i} and Part A {ii} and the **EMD in a sealed envelope marked as "Technical-Commercial Bid and Terms and Conditions- Part A with EMD"** and **Price Bid**, given as Part B **in another sealed envelope marked as "Price Bid – Part B"** and **putting both these envelopes in ONE ENVELOPE marked as "TENDER FOR OPERATION AND MAINTENANCE OF AC PLANTS AND ACCESSORIES"**.

2. **CONFIRMATION OF TERMS AND CONDITIONS** : Complete details and specifications of the Operation and Maintenance work should be understood thoroughly, the general instructions given in the documents should be followed and the Terms and Conditions given in the tender documents should be thoroughly understood and complied with. The tender documents should be returned duly signed as a token of having understood the scope and in compliance of all the terms and conditions mentioned in the same.

3. **ELIGIBILITY CRITERIA:**

The vendor/s submitting tender must (a) be a manufacturer of equipments like Open type Reciprocating/Screw Compressors, (b) have servicing facility in Ahmedabad / Gandhinagar and (c) have executed similar kind of Operation and Maintenance in single contract of not less than Rs.10 Lakhs in a year consecutively for two years.

4. **TENDER FEE AND REQUEST FOR TENDER DOCUMENTS :**

Tender Fee is Rs.200.00. Request for Tender Documents should be submitted to the Stores Incharge along with the Tender Fee of Rs.200/- payable by DD/Banker's Cheque payable at Ahmedabd in favour of Institute for Plasma Research and the documentary evidence for meeting the Eligibility Criteria as stated above.

5. **ISSUE OF TENDER DOCUMENTS:**

Tender Documents shall be issued only if the tenderer requesting for Tender is fulfilling the Eligibility Criteria as mentioned above and the Tender Fee as required is received along with the request and proof confirming fulfillment of the Eligibility Criteria. The tenderer may, at his option, download the



Tender Documents which will be uploaded in the IPR Website "[www.ipr.res.in/purchasetenders.html](http://www.ipr.res.in/purchasetenders.html)." on the last day fixed for issue of Tender Documents to the eligible vendors. However, the tenderer who is opting for use of downloaded version of the Tender Document must ensure that he fulfils the eligibility criteria as stipulated above and the tender is accompanied by the prescribed Tender Fee and EMD. The last date for receiving the request for issue of Tender document is 10.12.2008 as per the Tender Notice published. The envelope containing the request must indicate "Request for Tender Document against Tender Notice No. IPR/ST/TN-OMC/02/2008 dated 30.11.2008.

6. No request for the extension of due date will be considered.
7. Late/Delayed offers will not be accepted.
8. **Tender as indicated in Sr. No. 1 of General Conditions as stated above should be submitted to the Stores Incharge at the above address by 1.00 p.m. on 26/12/2008 and the envelope containing Part-A(i) and Part-A(ii) with the EMD shall be opened on the same day at 2.30 p.m. in the presence of attending tenderers.**
9. In the event of any date indicated above is a declared Holiday, the next working day shall become operative for the respective purpose mentioned herein.
10. IPR will not be responsible for any delay/loss of documents in transit.
11. Tenderers should furnish/enclose full technical details/literature, and confirm the terms and conditions attached with the tender.
12. **Tenders received without EMD will not be considered and the tenders downloaded from the IPR website should accompany both prescribed EMD and Tender Fee.**
13. **Those who do not meet with the eligibility criteria need not submit the tender.**
14. The Director, IPR reserves the right to accept or reject any offer in full or part thereof without assigning any reason thereof.

***NOTE: Issue of tender documents does not mean that a vendor is qualified to receive and submit tenders. IPR's decision to consider as to whether a vendor has met with the eligibility criteria is final.***





પ્લાઝ્મા સંશોધન સંસ્થા  
પ્લાઝ્મા અનુસંધાન સંસ્થાન  
INSTITUTE FOR PLASMA RESEARCH

ભાટ, ગાંધીનગર 382 428 :: ભાટ, ગાંધીનગર 382 428 :: BHAT, GANDHINAGAR 382 428

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ઈ-મેલ / ई-मेल / E-mail : [stores@ipr.res.in](mailto:stores@ipr.res.in)

### INSTRUCTIONS TO BIDDERS AND TERMS AND CONDITIONS

1. The offer and any order resulting from this tender shall be governed by our Conditions of Contract and tender submitted by the vendor/s against this tender notice. Vendor/s shall be deemed to have read and understood the tender completely.

2. The counter terms and conditions, if any, offered by the vendor shall not be deemed to have been accepted by us, unless a specific written acceptance thereof is obtained from the Institute.

3. **CLARIFICATIONS :**

Any technical and commercial questions, information, clarifications, etc. that may be required pertaining to this Tender may be obtained from Stores Incharge before submitting the tender.

4. Bids shall be complete in all respects and shall include properly filled in prices, other specifications, schedules, relevant drawings and catalogues as necessary alongwith the bid covering letter, all in duplicate.

5. **TENDER :**

Tender should be submitted in sealed envelope stating on the top "TENDER FOR OPERATION AND MAINTENANCE OF AC PLANTS AND ACCESSORIES" along with (i) Earnest Money Deposit (EMD) for Rs.30,000/- payable by Demand Draft/Pay Order/Banker's Cheque drawn in favour of *Institute for Plasma Research* at Ahmedabad and (ii) **Technical Bid and Terms and conditions, i.e., Part-A{i} and Part-A{ii} put in one envelope** and (iii) **Price Bid, i.e. Part-B; put in another envelope** (all in duplicate) to the Stores Incharge at the above address latest by 1.00 p.m. on **26/12/2008.**

(a) **Opening of Technical Bid and Terms and conditions**

Envelope containing Technical Bid, Terms and conditions, i.e., Part-A {i} and Part-A {ii} of the Tender and the EMD shall be opened at 1430 Hrs. on the same day, 26<sup>th</sup> of December 2008.



**(b) Opening of Price Bid**

Envelope containing Price Bid, i.e. Part B of the short listed parties shall be opened later and the date of opening shall be intimated to the short listed parties well in time.

**6. SERVICE :**

The Service includes Operation and Maintenance and must be provided strictly conforming to our scope. Deviation, if any, should be clearly indicated by the tenderer in their quotation.

**7. REPAIRS AND REPLACEMENTS**

Repairs and Replacements are spelled out clearly in the detailed scope. Those which are not covered under the scope of the contractor are also given very clearly. The repairable items mentioned under the heading '**Repairs:**' can be repaired by the tenderer and made functional. If they are found not repairable, they need to be replaced by the tenderer with new one. Similarly the items mentioned under the heading '**Replacement of Items:**' if found faulty need to be replaced by the tenderer with new one without trying any repairing work on these items within a reasonable time which will be decided by IPR.

**8. PRICES AND RATES :**

The quoted price should not be subject to price escalation for whatsoever reasons. The quoted price shall be firm, fixed and non-revisable during the validity/extended validity of Work Order/contract. Break-up of price, wherever required, should be furnished.

Prices are to be quoted according to the units indicated in the tender form. When quotations are given in terms of units other than those specified in the tender form, relationship between the two sets of units must be furnished.

Whenever options are specified in the tender documents, IPR reserves the right to accept any option/s irrespective of whether all the vendors have quoted for all the options or not. The decision of IPR in this regard will be final.

Tender should be free from Correction and Erasing. Corrections, if any, must be attested. All amounts shall be indicated both in words as well as in figures. Where there is difference between amounts quoted in words and figures, amount quoted in words shall prevail.

IPR shall be under no obligation to accept the lowest or any tender.

Rates must be submitted in separate envelope in the Rate Schedule given in Part B.

**9. SALES TAX/SERVICE TAX/VAT etc.:**

We have no "C" or "D" form. **Kindly indicate the percentage of sales-tax, surcharge, if applicable and other levies legally leviable and intended to be claimed.** In case this is not done, no claim on these accounts would be admissible later.

**10. EXCISE DUTY :**

As per Notification No.10/97-CE (Central Excise) dated 1-3-1997, the Purchaser is entitled for availing Excise Duty exemption at present. Excise Duty Exemption Certificate, wherever applicable, and as per rules will be issued at the appropriate time. Hence Excise Duty for such items should not be included in the BID. However, prevailing percentage of Excise Duty may be indicated.



**11. EARNEST MONEY DEPOSIT (EMD):**

The Bidder shall submit interest free Earnest Money Deposit (EMD) for Rs.30,000/- (Rupees Thirty thousand only) by Demand Draft / Pay Order / Banker's Cheque in favour of "Institute for Plasma Research" payable at Ahmedabad. Tenders received without EMD will be rejected at the discretion of IPR. **The EMD submitted shall be refunded only after the tender is finalized. No interim query on account of EMD shall be entertained. The EMD will be forfeited if the tenderer fails to accept the LOI or intimation to commence the work within 15 days from the date of award of the same.**

**12. VALIDITY OF OFFER :**

The offer must be valid for 120 days.

**13. FOLLOW UP AND CANVASSING :**

Follow up and canvassing on the part of tenderer shall disqualify the tender/s from consideration. The refund of EMD shall be the basis to know that the tender is not considered in their favour.

**14. VALIDITY OF CONTRACT :**

- a. The contract, if awarded, may be in force initially for a period of three months, which may be extended for the entire term of the contract if the performance during the initial period is found to be satisfactory.
- b. If IPR is not satisfied, in the event of award of contract, with the performance of the contractor during the period of contract including the trial period, IPR reserves the right to terminate the contract by giving 30 days notice to the successful tenderer. The contractor shall be required to hand over the Plant and Equipments in satisfactory working condition to IPR which will have to be certified by the Section Head/Division Head, AC & WC Section. IPR. The expenditure to be incurred for making the Plant and Equipments in satisfactory working condition in such an eventuality shall be recovered from the contractor.
- c. Validity of the contract shall normally come to an end on the last day of its validity period / extended period of validity. Therefore, IPR is not bound to issue separate letter to the contractor indicating expiry of the Contract. The Contract must be ready for handing over the Plant and Equipments in satisfactory working condition to the incoming contractor vide Clause 18 given herebelow.
- d. IPR reserves the right to extend the validity of the period of contract for a further period of one year on the same rate and terms and conditions.

**15. TERMINATION OF CONTRACT :**

If the performance of the Contractor on award of the contract is not found satisfactory during the period of validity or extended period of validity of the Contract, IPR reserves the right to terminate the contract by issuing three month's notice to the contractor.

If reason for termination is serious and keeping the contractor is detrimental to the interest of the institute the contract may be terminated with immediate effect.

**16. PAYMENT**

The Contractor shall bill for 1/12<sup>th</sup> of the accepted annual amount every month and the payment shall be made within 30 days from the date of receipt of the bill.



- a) All the spares/consumables procured and used by the successful tenderer shall be original/genuine and new. IPR reserves the right to ask the successful contractor to use only original, genuine and new spares/consumables. **However, before going to use, the contractor shall furnish necessary delivery Challans to the IPR.** The decision of designated Engineer / (or) Section Head/Division Head/ (or) Project Leader-AC&WC section in respect of spares/consumables will be binding on the successful contractor
- b) If the work carried out by the contractor is not satisfactory, IPR shall hold such bill/s till satisfactory services are provided.
- c) Any amount due from the contractor to IPR will be recovered from his ensuing monthly bills.

17. **PENALTY :**

Please Refer to Clause C under Penalty (Page No. 8) of this Tender Document.

18. **HANDING OVER AND TAKING OVER OF EQUIPMENTS :**

The tenderer if awarded the contract shall be responsible to take over the plant, machinery and equipment in satisfactory working condition from the outgoing contractor. Similarly he shall be responsible to hand over the plant, machinery and equipment so taken over to the incoming contractor at the time of expiry / termination of the contract. Payment for the last bill as well as release of Security Deposit will be subject to fulfillment of satisfactory handing over and complying with all the terms and conditions of the contract to the entire satisfaction of IPR. IPR reserves the right to hold the last payment and Security Deposit till the tenderer if awarded the contract completes the pending job if any, to the entire satisfaction of IPR, at the expiry of the tenure of the contract, including satisfactory handing over of the plant to the incoming contractor. In case the institute has to incur any expenditure to make the Plant and Equipments in satisfactory working condition at the time of handing over it shall be recovered from the contractor.

19. **SECURITY DEPOSIT :**

The successful contractor will have to furnish to the Institute an interest free security deposit for 10% (Ten percent) of the order value in the form of Bank Guarantee of an equivalent amount from a nationalised/scheduled Bank within 15 days from the date of LOI/Work Order and the said Guarantee should be valid till the validity of the contract. The Security deposit shall be forfeited in case the tenderer who is awarded the contractor does not commence the work within the time limit specified or fails to perform within the stipulated guidelines of the institute or fail to comply with any of the terms and conditions in the Work Order/contract including failure in handing over the plant and equipments in satisfactory working condition as per the terms of the contract.

20. **VALIDITY OF OFFER:**

The offer submitted should be valid at least for 120 days from the date of opening of the tender.

21. **SUB CONTRACT :**

The tenderer if awarded the contract shall not sub contract any portion in any phase of the work covered in the tender document without prior written approval of IPR. The decision of the IPR to accept or reject the request of the contractor to subcontract the scope of work in full or part thereof shall be final and based on the submission of credentials of proposed sub contractor. However, the main contractor shall be liable for compliance of all the conditions of the contract including for the acts and omissions of the sub contractor.



**22. JURISDICTION :**

The Contract/Work order shall be governed by the Laws of the country for the time being in force. The Courts of Ahmedabad only shall have jurisdiction to deal with and decide any legal or dispute arising out of this contract.

**23. DISPUTES :**

Any disputes or difference arising out of or in connection with the Contract/Work Order shall be to the extent possible settled amicably between the parties. If amicable settlement cannot be reached then all disputed issues shall be settled by arbitration.

**24. ARBITRATION:**

In the event of any dispute or difference arising under this Contract, the matter shall be referred to the Arbitrators one each nominated by the Purchaser and Contractor from their respective organisations. In case the said Arbitrators are not able to settle the dispute by themselves, the matter shall be referred to the Arbitrator mutually nominated by the Institute and the Contractor and whose decision will be final and binding on both the parties. The venue of arbitration shall be IPR. Subject to as aforesaid the Arbitration Act, 1940 and the rules thereunder and any statutory modification thereof for the time being in force shall be deemed to apply to the Arbitration proceedings under this Contract.

25. Late / Delayed tenders will not be accepted. Incomplete tenders may be rejected at the discretion of IPR.

26. **IPR is not bound to accept the lowest tender. IPR reserves the right to select any vendor at its sole discretion.**

27. IPR reserves the right to place order on a single party or to split the order at its sole discretion.

28. The Director, IPR reserves the right to accept or reject any quotation/tenders fully or partly without assigning any reason.

**We agree to the above terms and conditions.**

**Place:**

**Date :**

**Signature of Bidder with seal**

**Note: A copy our terms and conditions duly signed should accompany your quotation.**





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**TAXES AND DUTIES**

Sr. No.	Particulars	Excise Duty	CST/GST /VAT	Service Tax	Any Other
1.	Operation				
2.	Extra Time Operation on week days				
3.	Extra Time Operation on Sundays and Holidays				
4.	Maintenance				

Note: 1) Non compliance to technical as well as commercial terms and conditions mentioned in the tender, bid is liable to get rejected. Please contact us for any clarifications before bidding.

Date :

Place :

Name and Signature of Bidder



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**Part – B**

**Price Bid**

(Page No. 61 to 66)





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**SCHEDULE OF RATES - QUOTATION FORMAT**

**ANNUAL RATE FOR OPERATION AND MAINTENANCE CONTRACT FOR ABOVE DESCRIBED SYSTEM**

**(TO BE RETURNED TO IPR DULY FILLED IN, SIGNED AND STAMPED)**

Sr. No.	DESCRIPTION OF PLANTS/ SYSETMS		ANNUAL RATE, (excluding taxes and duties) (in Rs.)	
			Operation	Maintenance
1.	KBAC plant	240 TR		
2.	TBAC plant	200 TR		
3.	SST1 Air conditioning Plant	375 TR		
4.	Chiller Package Unit (for Beta Lab Experimental Device)	7 TR		
5.	Chiller Package Unit (for Spectroscopy/ Diagnostic Experimental Device)	10 TR		
6.	Chiller Package units (for First face wall experiment, LVPD experiment Device & ECRH system)	27 TR		
7.	Chiller Package unit for Vacuum Furnace experiment Device	10 TR		
8.	Chiller Package unit for LASER experiment Device	15 TR		
9.	Air cooled Package unit (for Control room of Aditya Hall)	10 TR		
10.	Air cooled Package unit (for APPS Hall)	20 TR		
11.	Air Cooled Package unit (for Computer Hall (Mezzanine Floor))	10 TR		
12.	Air Cooled Package unit (for Computer Hall)	40 TR		
13.	Air Cooled Package unit (for R.F. Lab.- Ground. & First Floor)	40 TR		
14.	Air Cooled Package units (for Administration & Purchase section)	15 TR		
15.	Air washer Unit (for canteen)	12000 CFM		
16.	Ventilation Systems (for various plant rooms / Utility Halls / Cryogenic Hall/ He-Compressor Hall)	Diff. capacities		
17.	D.M. Water Cooling Plants (for various Experimental	10 & 30		



	Devices)	CM		
18.	Soft Water Plant (for Water Cooling Plants)	30 CM		
19.	R.F. Water Cooling Systems	68 TR		
20.	<b>Total</b> → → → →			
<b>Total Amount in Words</b>				
<b>A. Operation</b>				
<b>Rupees</b>				
<b>B. Maintenance</b>				
<b>Rupees</b>				

Note: 1) Non compliance to technical as well as commercial terms and conditions mentioned in the tender, bid is liable to get rejected. Please contact us for any clarifications before bidding.

2) Taxes and duties are given separately

Place :  
Date :

Name and Signature of Bidder  
(Office Seal)





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**CONSOLIDATED AMOUNT QUOTED FOR OPERATION AND MAINTENANCE**

Sr. No.	Particulars	Rate per month	Amount	
			Per Year	For Two years
1.	Consolidated Operation Charges			
2.	Consolidated Maintenance Charges			
3.	Total			

Place :  
Date :

Name and Signature of Bidder  
(Office Seal)





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**EXTRA TIME OPERATION CHARGES – RATES ONLY**  
(excluding taxes and duties)

Sr. No.	Particulars	Rate Per Hour in Rupees	
		In Figure	In Words
1.	<b>Operation and Maintenance Charges</b>  For operation of main plants/ systems described above during extra hours, i.e. before 8.30 a.m. and / or after 5.30 p.m. on all working days (Monday to Saturday)		
2.	<b>Operation and Maintenance Charges</b>  For operation of main plants/systems described above on Sundays and National Holidays, if warranted.		

- Approximately 2000 extra hours of operation may be considered per year. This only an indication. (*Institute is not bound to pay for this if there is no extra hour operation or extra hour operation is less than 2000 Hrs.*)
- Refer for details of equipment specifications & plants maintenance schedule respectively covered under the scope of this contract.

We have understood the scope of work completely. The above rates have been quoted after fully understanding the job. We confirm that the above rates will be firm for a period of 3 years from the date of awarding the contract. We also agree to all the terms and conditions of the Tender.

Note: 1) Non compliance to technical as well as commercial terms and conditions mentioned in the tender, bid is liable to get rejected. Please contact us for any clarifications before bidding.

Place :

Date :

Name and Signature of Bidder  
(Office Seal)





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भंडार अनुभाग / भंडार अनुभाग / STORES

ई-मेल / ई-मेल / E-mail : [stores@ipr.res.in](mailto:stores@ipr.res.in)

**TAXES AND DUTIES**

Sr. No.	Particulars	Excise Duty	CST/GST /VAT	Service Tax	Any Other
5.	Operation				
6.	Extra Time Operation on week days				
7.	Extra Time Operation on Sundays and Holidays				
8.	Maintenance				

Note: 1) Non compliance to technical as well as commercial terms and conditions mentioned in the tender, bid is liable to get rejected. Please contact us for any clarifications before bidding.

Date :  
Place :

Name and Signature of Bidder  
(Office Seal)

